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RADIO COMMUNICATION SYSTEM
[MUSEN TSUSHIN SHISUTEMU]

SEIICHI FURUTA

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INVENTOR(S) (72): FURUTA, SEIICHI

APPLICANT(S) (71): DENSO LTD.

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/2

[Claim]

[Claim 1]

A radio communication system which communicates by connecting to a radio communication network from a radio communication device through a base station, the invention characterized as follows: when notification is made of the movement status of the abovementioned radio communication device, the abovementioned radio communication network specifies on a priority basis the hands-free communication mode for the radio communication device;

[Claim 2]

A radio communication system as described in Claim 1 wherein the abovementioned radio communication system is characteristic in that it is configured so that it receives position detection signals from a position detecting means which moves along with a radio communication device through said radio communication device and detects these based on the amount of change in these;

[Claim 3]

A radio communication system as described in Claim 2 wherein the abovementioned position detection means is a position sensor placed so that it forms an integral piece with the abovementioned radio communication device;

[Claim 4]

A radio communication sensor as described in Claim 2 wherein the abovementioned position detection means is a movable body position detection means mounted on a movable body when the abovementioned radio communication device moves along with the movable body;

[Claim 5]

A radio communication system as described in Claim 1 wherein the abovementioned radio communication network is configured so that detection is carried out by receiving detection signals from a movement detection means used to detect the movement status of the movable body which moves along with the radio communication device through said radio communication device;

[Claim 6]

A radio communication system as described in Claim 1 wherein the abovementioned radio communication network is configured so that detection is carried out based on changes in the strength of the signals of the electric waves for communication carried out with the radio communication device;

[Claim 7]

A radio communication system as described in Claim 1 wherein the abovementioned radio communication network is

configured so that detection is carried out based on changes in the amount of compensation of the difference in the phase shift of the time alignment signals for communication carried out with the radio communication device;

[Claim 8]

A radio communication system as described in Claim 1 wherein the abovementioned radio communication network is configured so that it communicates with the abovementioned radio communication device using a W-CDMA (Wideband-Code Division Multiple Access) mode and detects movement of said radio communication device by detecting changes in the measured position;

[Claim 9]

A radio communication system as described in any of Claims 1 through 8, wherein the abovementioned radio communication device is provided with a canceling means which makes it possible to make a call by canceling the designation when there is an incoming call for which the hands-free communication mode has been designated by the abovementioned radio communication network.

[Detailed Description of Invention]

[0001]

[Technical Field]

The present invention relates to a radio communication system which communicates by connecting to a radio communication network from a radio communication device through a base station.

[0002]

[Problems Which the Present Invention is Intended to Solve]

At the present time, using a mobile phone set as this type of radio communication device while driving is prohibited by law for safety concerns. As a result, there are mobile phone sets which are provided with a function enabling them to set the drive mode for incoming calls and to set a hands-free mode.

[0003]

However, in actuality, there are cases in which the user gets into an automobile and drives with the mobile phone set placed in a briefcase or handbag or pocket and the user oftentimes forgets to make the mode switching setting. While this mode switching setting is a useful function, people oftentimes forget to make the mode

switching setting or neglect to make the setting each and every time as it is troublesome to do so.

[0004]

Taking note of the abovementioned situation, it is an object of the present invention to provide a radio communication system for a radio communication device provided with a hands-free function so that a call can be made automatically in the hands-free mode when there is an incoming call.

[0005]

[Means Used to Solve the Problems]

When the present invention as described in Claim 1 is used, when the radio communication network detects the movement status of a radio communications device when a user who is holding the radio communication network is in motion while driving an automobile, communication is carried out by designating the hands-free communication mode for the radio communication device on a priority basis so that hands-free communication can be carried out automatically without the user holding the radio communication device having to use his/her hands while driving, communication can be carried out without having to

remove one's hands from the driving wheel, thereby increasing the safety.

[0006]

In this case, the person holding the radio communication device oftentimes forgets to make the setting to the hands-free communication mode beforehand so that it corresponds to the driving or other states and accidents are prevented from occurring when a call is received to communicate in this state.

[0007]

The invention as described in Claim 1 receives detection from the radio communication network side as to

/2

the movement status of the radio communication device receives position detection signals for the position detection means through the radio communication device and makes a determination so that the movement status thereof can be detected based on information on the position which changes from moment and moment.

[0008]

The invention as described in Claim 2 can detect the movement status from the radio communication network side using position detection signals as a means for detecting the position of the position sensor placed so that it forms an integral piece with the radio communication device so that, unlike when a position sensor placed on an automobile and other movable body is used, the radio communication device is held and the movement status can be detected just by getting into the vehicle in the abovementioned configuration.

[0009]

The invention as described in Claim 4 uses a movable body position detection means loaded on the movable body as a position detection means, such as a car navigation device and other position detection use GPS device as a position detection means in the invention as described in Claim 2 so that the position detection means need not be added to the configuration of the radio communication device and the abovementioned function can be attained while maintaining a simple configuration.

[0010]

The invention as described in Claim 5 detects the movement status of the radio communication device on the radio communication network side by manually receiving detection signals from the vehicle speed sensor used to detect the movement status of the movable body and from the rotation sensor and other movement detecting means used to detect the rotation of the wheels in the invention as described in Claim 1 so that the movement status of the radio communication device can be detected without setting in place a dedicated movement detection sensor.

[0011]

The invention as described in Claim 6 detects the movement status of the radio communication device by taking as a base the changes in the intensity of the reception signals for the electric waves for communication carried out between the radio communication devices and recognizing the changes in the intensity of the signals received as changes for both distances and detecting these on the radio communication network side so that no special configuration is required on the radio communication device in the invention as described in Claim 1.

[0012]

The invention as described in Claim 7 detects the changes in position, that is, the movement status of the radio communication device based on the changes in the amount of compensation in the signals using the time alignment signals for the communication in the telephone network and the like as a radio communication network so that the movement status of the radio communication device can be detected without setting up a special configuration.

[0013]

The invention as described in Claim 8 has a configuration whereby a W-CDMA system is used for communication between the radio communication network and the radio communication device and detects changes in the movement position of the radio communication device by using the changes in the measured position so that the movement status of the radio communication device can be detected without setting up a special configuration in the invention as described in Claim 1.

[0014]

The invention as described in Claim 9 places a cancelling means on the radio communication device and when

there is an incoming call designating a hands-free communication mode from the radio communication network, the user does not drive the vehicle and the like; when the user can answer when this is not a hands-free communication mode, he can cancel the hands-free communications mode so that when designation has automatically been made to the hands-free communication network side, regardless of the fact that it is not being operated, when a designation is made automatically from the radio communication network side, when the user does not wish to communicate in the hands-free communication mode, the usual communication can be carried out using the hands-free communication mode, the usual communication can be carried out by cancelling this and it has excellent handling features while ensuring safety.

[0015]

[Mode of Working Invention]

(First Mode of Working the Invention)

Next, we shall describe the first mode of working the invention when the present invention is applied for a mobile phone referring to Figure 1 through Figure 5. Figure 2 is a schematic view of the overall radio communication system in the present invention. A large number of base

stations 2a through 2c and the like are connected to module phone network as a radio communication network and these are mediated through communication with mobile phone set 3 which exists inside the communication area for each of the base stations 2a through 2c so that designation operations for the communications mode are made, which shall be discussed further on.

[0016]

Mobile phone set 3 can communicate by using a hands-free communication mode by operating a button (not shown in figure) when there are incoming calls and outgoing calls. Voice is output by an amount of sound which makes it possible to hear the voice when the user's ear is away from the receiving speaker in this hands-free communication mode. Furthermore, the user can return to the regular communication mode by operating a cancelling switch (not shown in figure) even when the hands-free communication mode is not set when there is an incoming call.

[0017]

Moreover, mobile phone set 3 is configured so that it is provided with a GPS (Global Positioning System) as a position detection means which is added to the regular

mobile phone set so that they form in integral piece. A global position can be detected by receiving signals from at least 3 (preferably 4) PGS satellites 5. Then, when position detection signals are obtained from GPS receiver 4, mobile phone set 3 sends these periodically as position data for base stations 2a through 2b.

[0018]

For example, the movement status can be determined when a user holding mobile phone set 3 is moving while operating automobile 6 and the position detection signals of GPS receiver 4 change from moment to moment and the user can determine the movement status from the amount of change in the position per hour.

[0019]

Next, we shall explain the operations for the mode of working the present invention. The movement status is determined by communicating with mobile phone set 3 as indicated by the flow chart showing the usual communication mode designation processing for the hands-free set at base stations 2a through 2c. Figure 3 through Figure 5 are flowcharts indicating the communication processing for mobile phone set 3 and indicate provision of the

information required for determining the movement status and the process for the communication processing according to the designation of the hands-free communication mode.

/4

[0020]

We shall describe the position detection processing routine for mobile phone set 3 wherein operations for determining the movement status of base stations 2a through 2b are carried out first of all, referring to Figure 3. Mobile phone set 3 carries out position detection operations using GPS receiver 4 as indicated above (Step P1) and the position detection signals obtained are sent to the nearest base stations 2a through 2b (Step P2). This position detection processing routine is carried out after a prescribed period of time has elapsed (for example, once every second) in standby mode.

[0021]

First of all, position detection signals are received periodically (Step S1) from mobile phone set 3 to determine whether or not mobile phone set 3 which is inside one's own communication area is in a movement mode in base stations 2a through 2c, as indicated in Figure 1. Then, the movement

speed is calculated (Step S2) from past position information received by mobile phone set 3. The distance moved by mobile phone set 3 based on position detection signals received the previous time or previous to that time is calculated and the movement speed is found by dividing by the hours moved.

[0022]

Thereafter, base stations 2a through 2c determine whether or not the moving speed calculated is equivalent to the moving speed of the automobile (for example, 30 km or more per hour). If [YES], the hands-free flag is set to [ON] (Step S4), to designate the communication mode; if [NO], the hands-free flag is set to {OFF} (Step S5).

[0023]

At this time, base stations 2a to 2c determine whether or not changes are occurring in the hands-free flag set mode (Step S6), that is, when there is a change from the mode set during the previous processing, a message is set (Step S7) as to whether or not a designation has been made to the hands-free communication mode to mobile phone set 3. Thereafter, the user is once again returned to Step S1 and the abovementioned processing is repeated.

[0024]

In mobile phone set 3, when a message is received in the abovementioned Step S7, a display according to the contents of the message received is made (Steps Q1, Q2). For example, when a hands-free communication mode is designated, [Hands-free designation] and other characters and symbols are displayed, the fact that the status has changed can be recognized when the user sees this.

[0025]

Next, we shall explain the processing routine when an incoming call is received by mobile phone 3 referring to Figure 5. When an incoming call is received at mobile phone set 3 which is located inside his/her own communication area, base stations 2a to 2c designate the communication mode depending on whether the hands-free flag for mobile phone set 3 is on or off and a call is made. The hands-free communication mode is designated on a priority basis and the call is made.

[0026]

A determination is made (Step R1) as to whether a hands-free communication mode is designated when there is

an incoming call in mobile phone set 3. If [YES], the hands-free communication mode is designated (Step R2). A ringing call is made in this mode and the user waits for the hook key to operate (Step R3). Furthermore, a determination is made as to whether the hands-free communication mode is cancelled by the cancel switch in this state (Step R4).

[0027]

When the user operates the hook key and there is an incoming call, mobile phone set 3 carries out control so that communication is carried out in the hands-free communication mode (Step R5). When the call is finished and the hook key is operated so that it is in ON mode, the user returns to standby mode. Moreover, when the cancel switch is operated by the user during the call (determined as [YES] in Step R4), the user waits until the hook key is operated (Step R6), and control is carried out so that the communication can proceed in the usual communication mode (Step R7).

[0028]

Furthermore, when hands-free communication mode is designated from base stations 2a to 2c when there is an

incoming call (determined as [NO] in Step R1), mobile phone set 3 carries out control so that the user jumps to Step R6 and the communication is carried out in the usual communication mode when the hook key is operated.

[0029]

In this mode of working the present invention, the configuration makes it possible to determine the movement state of mobile phone set 3 at the side of base stations 2a through 2b and to make a designation such that a communication is made in the hands-free communication mode. As a result, regardless of the mode set on the mobile phone set 3 side, an incoming call can be set automatically in the hands-free communication mode designated by the defining stations 2a through 2c when there is an incoming call. No driver mode need be set by the user and no hands-free communication mode need be set on an ad hoc basis, it is easy to use and safety is ensured.

[0030]

Furthermore, in the abovementioned mode of working the example, we explained a configuration whereby a dedicated cancel switch was placed on mobile phone set 3. However, it may also be configured so that the cancel switch does

double duty as another key. Moreover, the hands-free cancel function carried out by the cancel key is not restricted to cancelling operations when there is an incoming call and a variety of cancel modes may be set.

[0031]

(Second Mode of Working the Invention)

Figure 6 indicates the second mode of working the present invention. It differs from the first mode of working the present invention in that is has a configuration a GSP receiver 4 placed so that it forms an integral piece with mobile phone set 3 and is used instead as a position detection means, position detection signals from car navigation device 7 mounted on automobile 6 are received by mobile phone set 8 and these are sent to base stations 2a through 2c.

[0032]

In this mode of working the present invention, mobile phone set 8 is configured so that it has a communication interface which can communicate using the Bluetooth mode and it communicates with car navigation device 7. Car

/5

navigation device 7 is configured so that it is provided with GPS receiver 7b, display 7c and Bluetooth mode communication interface d.

[0033]

Car navigation device 7 matches current position and a map position based on position signals obtained by GPS receiver 7b by using a control circuit (not shown in figure) placed on main body part 7a and displays them on display 7c. At the same time, it displays the route calculated for the target destination designated by the user and provides a guide for the route using the route travelled by the automobile, the display made for the user and a voice guide and the like.

[0034]

When mobile phone set 8 is carried into automobile 6, communication is carried out in the Bluetooth mode either from mobile phone set 8 or car navigation device 7 and a network is formed (piconet is formed). Then, mobile phone set 8 has a program built in which requests that the position detection information detected periodically from car navigation device 7 by GPS receiver 7b be sent. When car navigation device 7 receives a request signal from

mobile phone set 8, position detection signals are sent in accordance with this.

[0035]

In the second mode of working the present invention, a simple configuration is used wherein information regarding the current location of mobile phone set 8 is used for position detection signals from GPS receiver 7b of car navigation device 7 which is mounted in the automobile so that only a Bluetooth mode communication interface is set up on both sides. Position detection signals are obtained reliably the movement status can be determined and the hands-free communication mode can be designated without using any cable connection or other cumbersome operations.

[0036]

Furthermore, it can be expected that this Bluetooth mode communication interface will be a standard feature in a variety of devices in the future. Therefore, a configuration which includes a communication interface can be realized without any special devices in order to attain this performance.

[0037]

(Third Mode of Working the Present Invention)

Figure 7 is the third mode of working the present invention. It differs from the third mode of working the present invention in that it is configured so that a car navigation device 7 is used instead as a movement detection means and a vehicle velocity sensor 9 is placed as a movement detection means.

[0038]

Vehicle speed sensor 9 is configured so that a sensor part 9a is placed so that it can detect the rotation speed of shaft 6c between the deferential gear coupled to wheel 6a and transmission 6b, the detection signals are inputted and the speed is detected. A communication interface 10 used for Bluetooth mode communication is placed on speed sensor 9 and communication is carried out with mobile phone set 8 as indicated above.

[0039]

Mobile phone 8 can determine the movement state of mobile phone set 8 which is the focus on base stations 2a through 2c by receiving speed signals from the speed sensor 9 loaded on automobile 6 and sends these to the closest

base stations 2a through 2c and the same effect as that indicated above can be obtained.

[0040]

Furthermore, we have explained that a speed sensor 9 was placed in the abovementioned mode of working the invention. However, the movement state of mobile phone set 8 can be determined by using a configuration which detects the number of rotations of the wheel instead of using speed sensor 9 and this can be determined after detecting the movement state of the automobile using an acceleration sensor and the like.

[0041]

(Fourth Mode of Working the Present Invention)

Figure 8 indicates the fourth mode of working the present invention. It differs from the first mode of working the present invention in that it consists of a system which is applied to mobile phone set 11 and base stations 12 a through 12c which uses the W-CDMA system as a communication mode. In the W-CDMA mode-based communication, signals for measuring the distance are sent to mobile phone set 11 which is located in each of the user's communication

areas 13a through 13c and the distance can be detected by responses thereof.

[0042]

The position of mobile phone set 11 which is the focus can be detected from the distance information detected at three base stations 12a through 12c. By repeatedly executing this position detection processing at prescribed time intervals, the movement status of mobile phone set 11 which is the focus can be determined.

[0043]

In the fourth mode of working the present invention, the conversation can be carried out by automatically using the hands-free communication mode while the user is driving the automobile by directly determining the movement status of mobile phone set 11 at base stations 12a through 12c, sending a message, designating the hands-free communication mode when there is an incoming call even when the user has forgotten to set mobile phone set 11 to the drive mode and the hands-free communication mode.

[0044]

(Fifth Mode of Working the Invention)

Figure 9 indicates the fifth mode of working the present invention. It differs from the first mode of working the present invention in that it is a method of determining the movement status of mobile phone set 3. This means that the configuration in this mode of working the present invention uses mobile phone set 3 which is not provided with GPS receiver 4. In this case, the system in the regular TDMA mode may be used and the system in the W-CDMA mode may be used as well.

[0045]

In this mode of working the present invention, the movement status is determined from the changes in the intensity of the signals received from mobile phone set 3 (or mobile phone set 11) in the communication area at base stations 2a through 2c (or base stations 12a through 12c). Each of the base stations 2a through 2c first of all detects the level of the signals received from the target mobile phone set 3 (Step T1). Next, the amount of change in the level of signals received just before this or in the past is calculated and the fluctuations over time are found (Step T2).

[0046]

Each of base stations 2a through 2c determines whether /6

the amount of change in the signal level found is equivalent to the movement status (Step T3), when there is an abrupt change and this is determined to be equivalent to the movement of the automobile, the movement status is determined (Step T4), and when that is not the case, it returns as is. When the movement status is determined in this way, base stations 2a through 2c set the hands-free flag to ON (equivalent to Step S4 in Figure 1), when such is not the case, the hands-free flag is set to OFF (equivalent to Step S5 in Figure 1). The following operations are the same as those indicated above so we shall dispense with an explanation of these.

[0047]

Even when this fifth mode of working the invention is used, base stations 2a through 2c determine the movement status of mobile phone set 3 based on the amount of change of the level of the signals received. When this is the

movement status, the hands-free communication mode is automatically designated to the hands-free communication mode so that the user can add on a function which makes it possible to handle the set easily without having to set in place a special configuration.

[0048]

(Sixth Mode of Working the Present Invention)

Figure 10 indicates the sixth mode of working the present invention. It differs from the fifth mode of working the invention in that it is a method which determines the movement status of mobile phone set 3. This means that in this mode of working the invention, the movement status is instead determined from the amount of change in the signal receiving level from mobile phone set 3 and the movement status is determined from the amount of change of the time alignment.

[0049]

Here, time alignment is a function which is generally carried out in the communication control of the mobile phone. The difference in the phases of the standard timing (burst signal receiving timing at base station) and the received burst signals for each slot is measured and the

transmission timing can be designated for the movement station (mobile phone set) as an absolute value based on the measuring results.

[0050]

When the movement status is determined, each of base stations 2a through 2c starts the flow chart indicated in Figure 10 and the amount of time alignment is first determined (Step W1), the difference in the amount of time alignment for the previous time or in the past is calculated and the amount of change in time is found (Step W2). Next, a determination is made as to whether the amount of change in the time alignment calculated is equivalent to the movement status (Step W3); if the answer is [YES], the movement status is determined (Step W4); if the answer is [NO], a return is made as is.

[0051]

Based on this, base stations 2a through 2c can determine the movement status of mobile phone set 3 from the amount of change in the amount of time alignment. When this is the movement status, a designation is automatically made to hands-free communication mode so that a function is

added which makes it easier for the user to handle without having to set in place a special configuration.

[0052]

There are no particular restrictions on the abovementioned mode of working the present invention and it can be altered or expanded as follows. In the abovementioned modes of working the invention, we have explained applications for mobile phone. However, needless to say, it can also be applied to a car phone.

[0053]

The movement status is determined by detecting the position using the position detection means. However, any configuration is sufficient as long as the amount of movement per hour at the very least can be determined without having to measure the position. Therefore, the movement status can be determined by driving the automobile.

[0054]

In the abovementioned modes of working the present invention, we explained using mobile phone set 3 or 11 provided with an integrated hands-free function. However,

it can be applied as well to a mobile phone having a configuration whereby it is connected separately to a hands-free kit.

[0055]

The cancel switch indicated in the first mode of working the present invention is by no means restricted to the cancelling function when there is an incoming call and the following types of functions can be provided. For example, it is also effective when the user is not driving even though he/she is moving in the automobile and even when the driver is driving and another person is in the vehicle and there is no incoming call on the hands-free set, the user can select the other party using the hands-free set, place it in call answering mode and cancel the call itself and it can be set as an expansion function to respond to a great many needs.

[0056]

This means that a setting function is provided in advance so that the hands-free can be cancelled only once when there is an incoming call and the hands-free designation may be canceled while the time is set and set or during a period when it is not set. Moreover, when calls

are made in the number designated when there is an incoming call (for example 3 times), the call comes in automatically using the hands-free set, and the switching operation is carried out during the call so that a switchover can be made to an incoming call wherein the regular calls can be made by canceling the hands-free. Moreover, a setting can be made such that the hands-free is cancelled for cases other than for a party registered or for non-registered parties.

[0057]

In each of the abovementioned modes of working the invention provided, when the movement status is determined, only a stationary driving mode is assumed. However, a stoppage of signals can be determined, parking on the shoulder of the road or another passenger can be determined and other states can be determined precisely and functions can be set which make it easy to use by using the Bluetooth mode communication function.

[0058]

Moreover, in the abovementioned modes of working the present invention, the setting for the hands-free communication mode was displayed on the display. However,

this may also be indicated by voice and an announcement can be made to the person making the call. Further, when it is inconvenient to use the hands-free mode, a function can be added whereby the call answering mode can be selected.

[Brief Explanation of Figures]

[Figure 1] A flow chart indicating the hands-free communication mode designation processing routine for mobile phone at base stations in the first mode of working the present invention.

[Figure 2] A system configuration diagram.

/7

[Figure 3] A flow chart indicating the position detection processing routine for the mobile phone set.

[Figure 4] A flow chart indicating the message display routine for the mobile phone set.

[Figure 5] A flow chart indicating the incoming call processing routine for the mobile phone set.

[Figure 6] A system configuration diagram for the mobile phone set in a second mode of working the present invention.

[Figure 7] A diagram equivalent to Figure 6 indicating the third mode of working the present invention.

[Figure 8] A diagram equivalent to Figure 2 indicating the fourth mode of working the present invention.

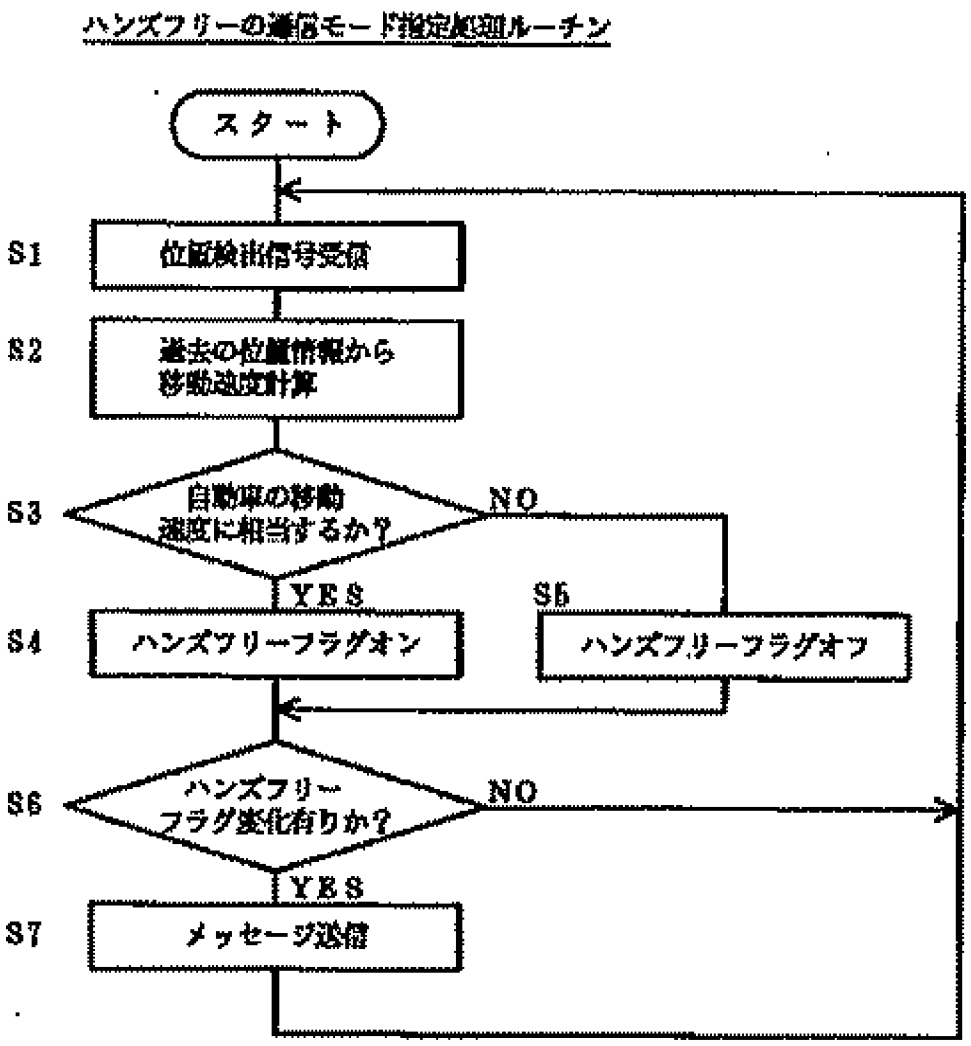
[Figure 9] A flow chart of the movement status determining processing routine of the fifth mode of working the present invention.

[Figure 10] A diagram equivalent to Figure 9 indicating the sixth mode of working the present invention.

[Explanation of Notation]

1 -- mobile phone set (radio communication network); 2a through 2c, 12a through 12c -- base stations; 3, 8, 11 mobile phone sets (radio communication device); 4 -- GPS receiver (position detection means); 5 -- GPS satellite; 6 -- automobile (movable body); 7 -- car navigation device; 7b -- GPS receiver (movable body position detection device); 7d, 10 -- communication interface; 9 -- speed sensor (movable body detection means).

【図１】



[Figure 1]

Hands-free Driving Mode Designation Processing Routine

Start

S1 position detection signal received

S2 movement speed calculated from past position information

S3 equivalent to moving speed of automobile? NO

YES

S4 hands-free flag on

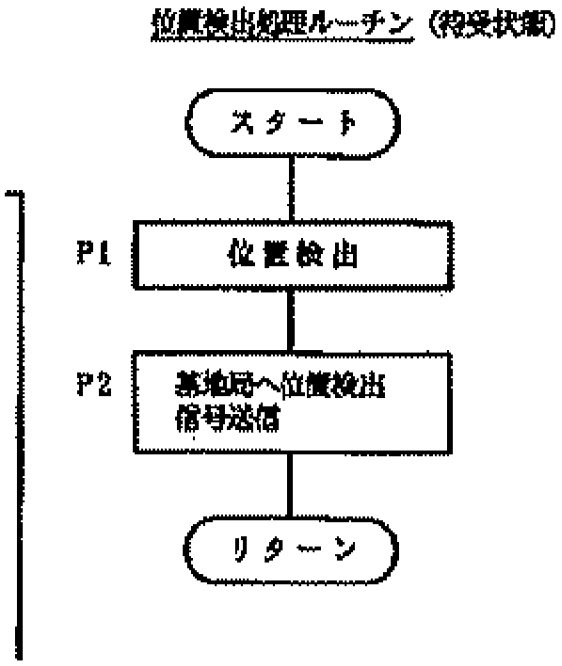
S6 hands-free flag off

S6 hands-free flag change? NO

YES

S7 message sent

【図３】



[Figure 3]

Position Detection Processing Routine (standby mode)

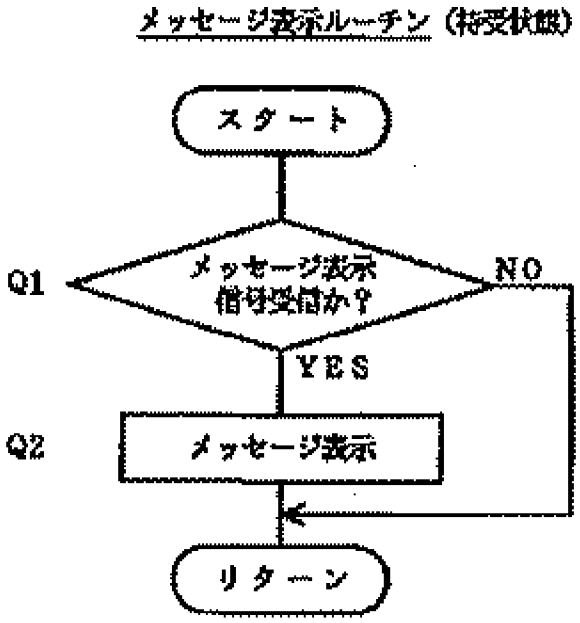
Start

P1 position detected

P2 position detection signal transmission to base station

Return

【図４】



[Figure 4]

Message Display Routine (standby mode)

Start

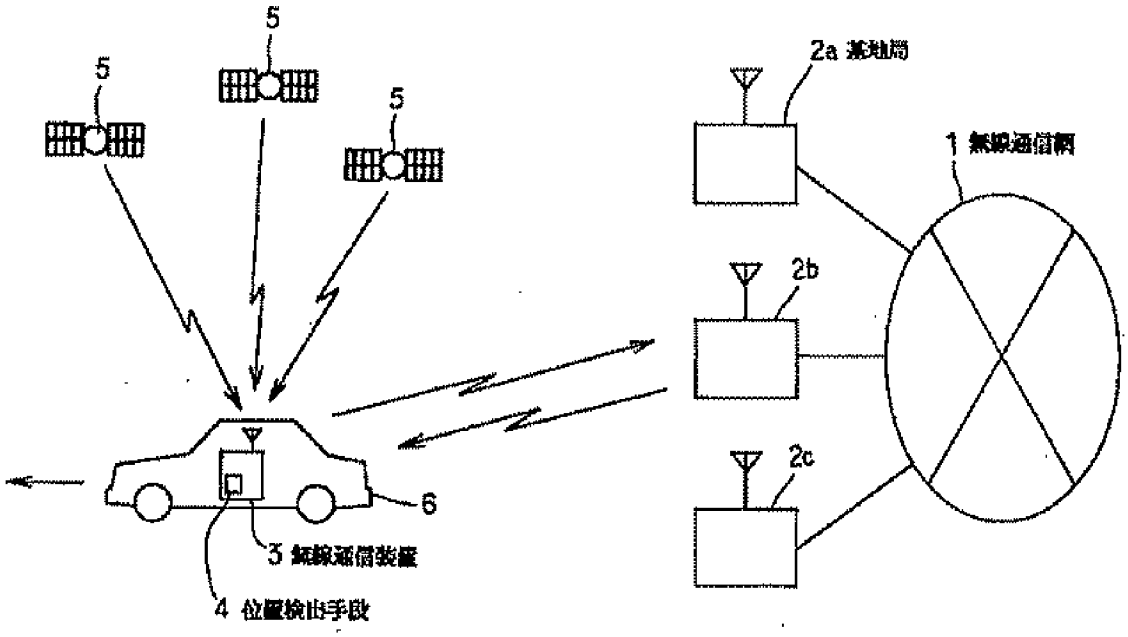
Q1 message display signal received? NO

YES

Q2 message display

Return

【図２】



[Figure 2]

[Callouts:

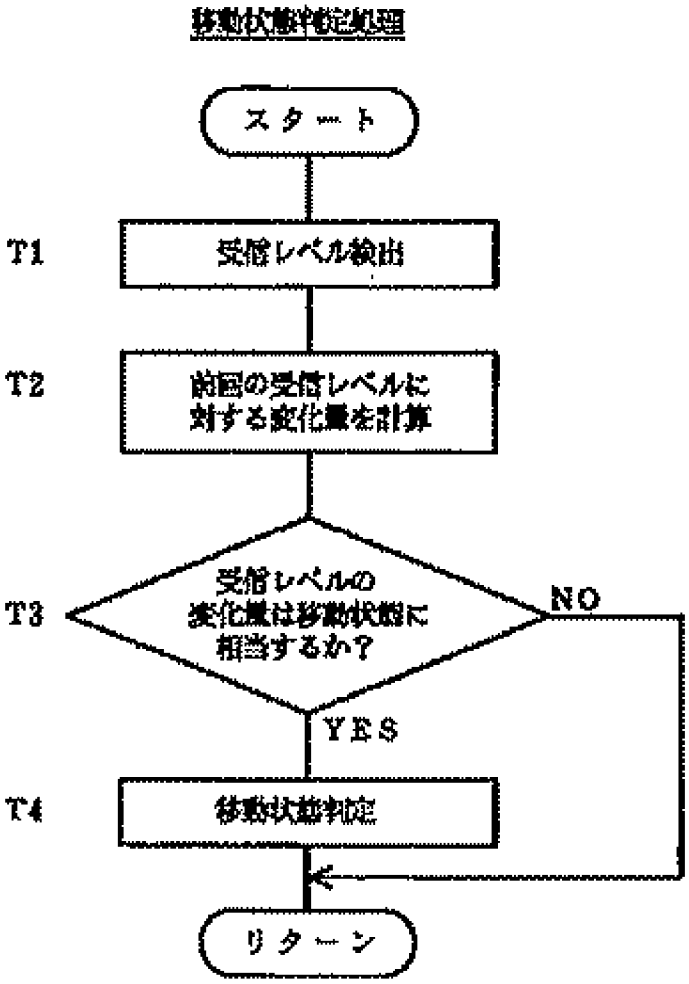
2a: base station

1: radio communication net

3: radio communication device

4: position detection means]

【図９】



[Figure 9]

Moving Status Determination Processing

Start

T1 received level detection

T2 amount of change in previous received level received is calculated

T3 is amount of change in receiving level equivalent to moving status? NO

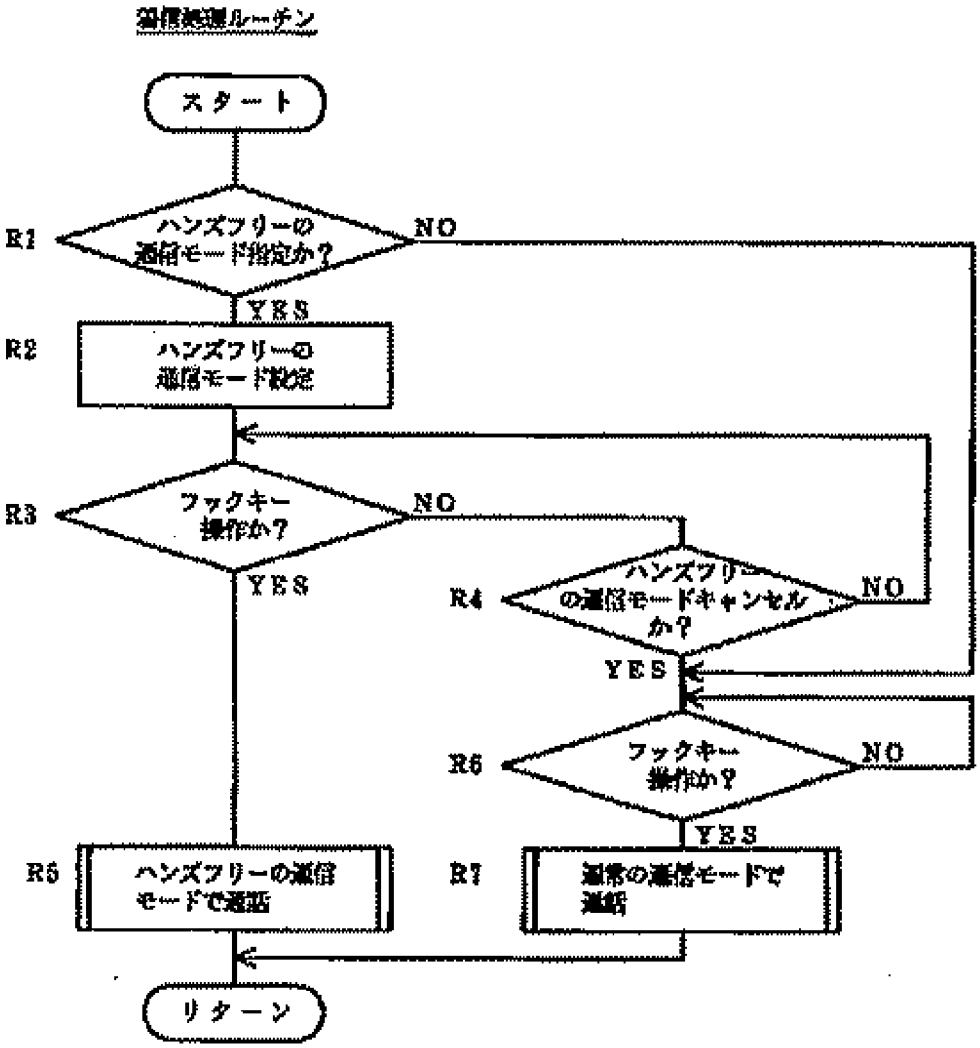
YES

T4 movement status determined

Return

/8

【図5】



[Figure 5]

Start

R1 hands-free communications mode set? NO

YES

R2 hands-free communication mode set

R3 hook key operated?

NO

YES

R4 hands-free communication mode cancel? NO

YES

R6 hook key operated? NO

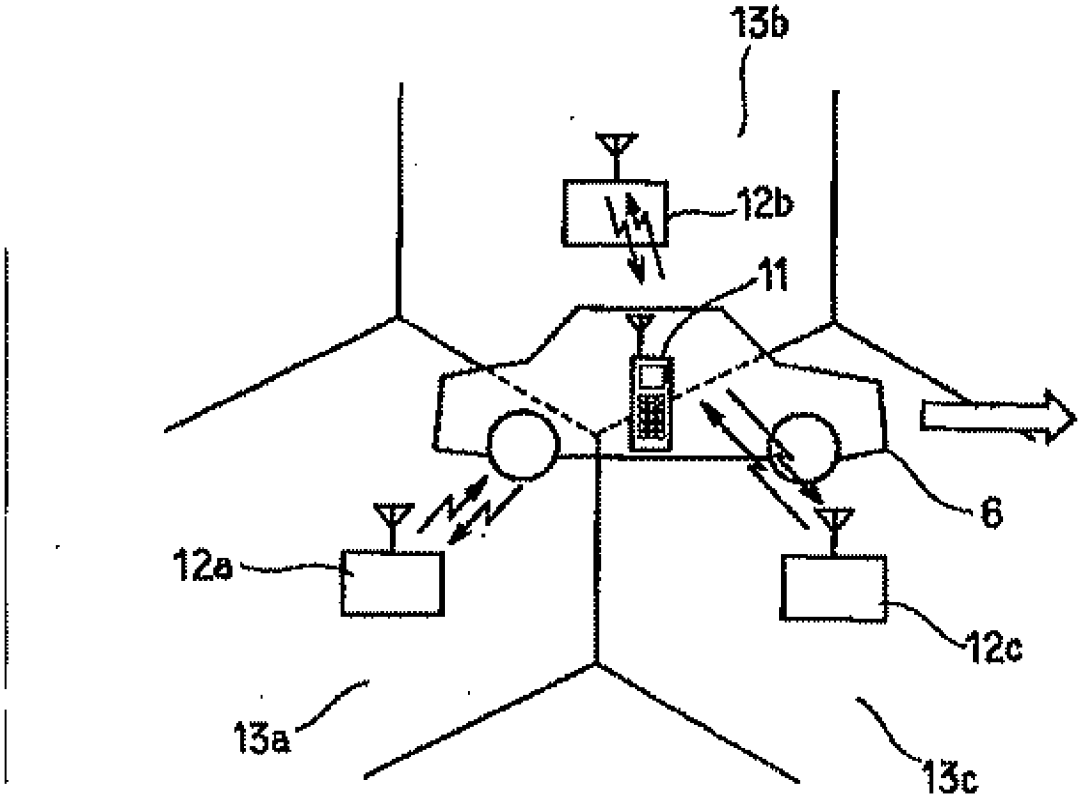
YES

R6 call made by hands-free communication mode

R7 call made by [illegible] communication mode

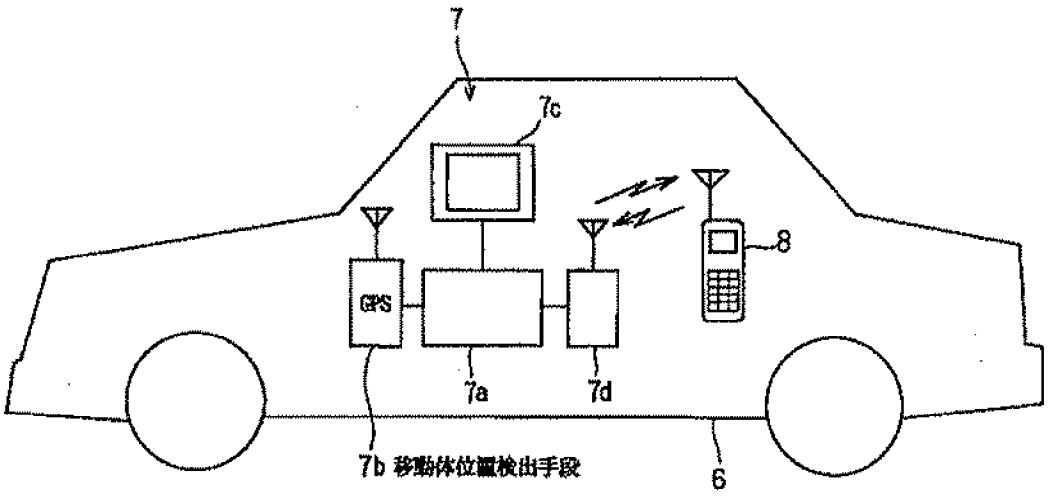
Return

【図８】



[Figure 8]

【図6】

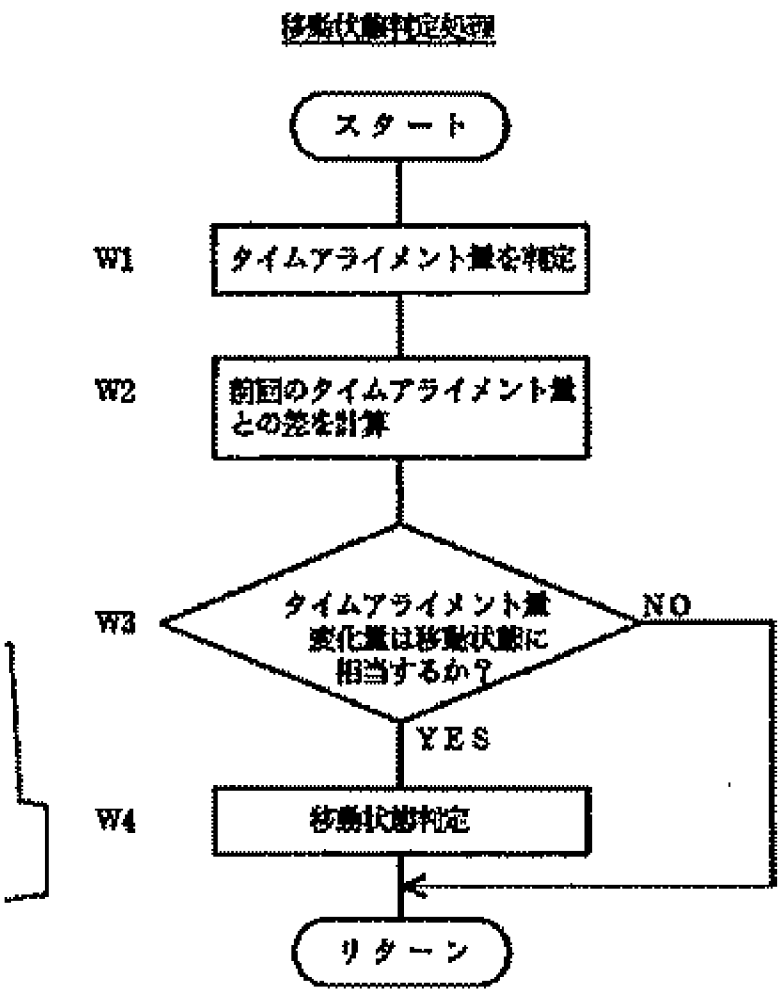


[Figure 6]

[Callouts:

Beneath figure: 7b movable body position detection means]

【図１０】



[Figure 10]

Movement Status Determination Processing

Start

W1 amount of time alignment determined

W2 calculate difference with amount of previous time alignment

W3 amount of change in time alignment equivalent to

movement status NO

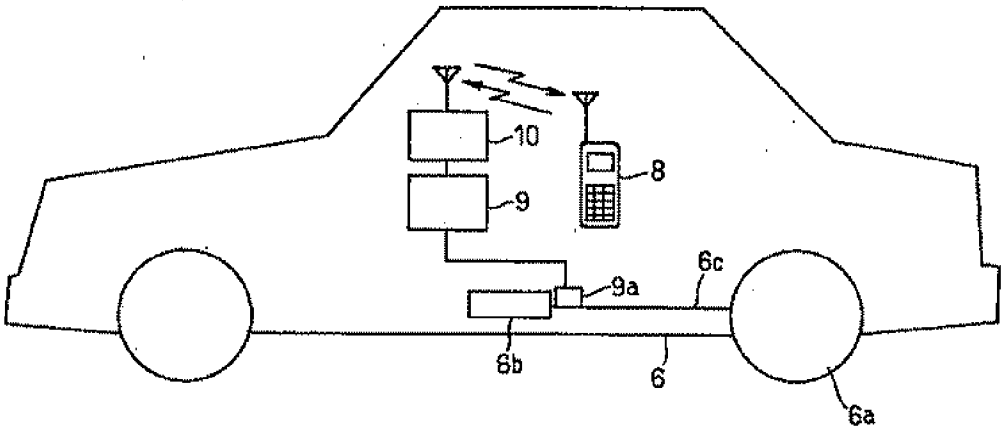
YES

W4 Movement status determined

Return

/9

【図7】



[Figure 7]